

reconsideration of those claims is respectfully requested.

Discussion of Claim Rejections under 35 USC 102

The Office Action rejected claims 1-3, 5-7, and 9-11 under 35 U.S.C 102(b) as being anticipated by Kato. Applicants respectfully traverse the rejections for at least the reasons set forth below.

The present invention, as for example shown in FIG 4, the taper portions at the opposite sides of the nut are a smooth convex shape and have a smooth joint from the middle fitting (or contact) portion. The features are recited in independent claim 1 as follows:

Claim 1. A ball screw comprising a screw shaft having a thread groove in the outer periphery thereof, a nut having a thread groove in the inner periphery thereof opposed to said screw shaft, and a plurality of balls disposed in a rolling way defined between said thread groove in said screw shaft and said thread groove in said nut, wherein a fitting surface engaging a support member with a direct contact for supporting said nut fitted therein is formed on the outer peripheral surface of the nut in the axial middle region of said rolling way and non-fitting surfaces that do not contact said support member are formed on the outer peripheral surface of the nut on the opposite axial sides of said rolling way, wherein the axial middle region includes a center point of the nut, wherein the fitting surface and the non-fitting surfaces of the nut are smoothly joined as a smooth convex surface (Emphasis added).

Similar features emphasized above are also recited in independent claim 5 and these features are not disclosed by Kato.

In re Kato, the Office Action refers to col. 4, lines 28-36. It can be understood from the disclosure that the conical section with and cone angle is desired (see appendix drawing with marking). The cone angle exists between the fitting surface and the non-fitting surface. This kind of design does not disclose or suggest the emphasized features recited in independent claims

1 and 5.

Further still, Kato's FIG 3 is the improvement in light of Admitted Prior Art (APA) of Kato in Fig. 4. As described by Kato, for the specific design in Fig. 4, when the nut member 6 is press fitted into the inner bore of the enlarged portion 4, part C provides a highly tight fit as compared to parts A and B (col. 1, lines 38-62 or more specifically lines 42-45). *Kato then discloses the Part C has the step-like recess, but not on the opposite part (part D as indicated in the appendix drawing).*

While in the present invention, the non-fitting surfaces are formed on the outer peripheral surface of the nut at both the opposite axial sides. As described in paragraph [0012] of the specification, such a structure serves to suppress a play between balls, the screw shaft and the nut in the axial middle, suppress the backlash of the ball screw. And, since, in the opposite axial sides, the outer peripheral surface of the nut does not engage the support member, the nut is allowed to elastically deform in the loading direction when the deviation or bending of the axis of the screw shaft occurs, thus, the occurrence of distortion can be prevented.

As shown in Figs. 2, 3, and 4 of Kato, the nut 5 has a tight fit with the enlarged portion 4 not only at middle part (part B) but also at the opposite part (part A). Kato realizes that, as the rigidity progressively increases with the proximity to the annular shoulder 4a (i.e., increasing from part A to part C as shown in Fig. 4), an extremely tight fit may be achieved by part C, but part A and part B may be made ineffective in retaining the nut 5. Col. 3, lines 52-60. To solve this problem, Kato proposes to provide a recess either in the enlarged portion 4 or on the nut 5 at part C, so that nut 5 is press fitted into the inner bore of the enlarged portion 4 over parts A and B (region of tight fit) while there is no contact between nut 5 and enlarged portion 4 at the part C (region of loose fit). Therefore, a relatively tight fit can be achieved between the nut 5 and the

enlarged portion 4 over a relatively large length of the nut 5. Col. 3, line 65 to col. 4, line 4. On col. 4, lines 37-42, Kato further teaches that “according to the present invention when press fitting a tubular nut member into an enlarged end portion of a hollow shaft, by providing a region of loose fit adjacent to the annular shoulder defining the inner boundary of the enlarged portion, it is possible to achieve a relatively uniform tight fit over a substantial axial length.” It is clear that Kato’s goal is to achieve a relatively uniform tight fit over a substantial axial length. To form a non-fitting surface on the nut at the opposite side, such as in the present invention, clearly will reduce the axial length over which a tight fit can be achieved and, therefore, would be against the teaching of Kato.

For at least the reasons discussed above, Kato does not anticipate the present invention as defined in claims 1 and 5. For at least the same reasons, dependent claims 2-3, 6-7, and 9-11 are not anticipated by Kato.

Discussion of Claim Rejections under 35 USC 103

The Office Action rejected claims 4 and 8 under 35 U.S.C. 103(a) as being unpatentable over Kato.

With respect to claims 4 and 8 respectively depending on independent claims 1 and 5, for at least the foregoing reasons, claims 1 and 5 are patentable over Kato. Therefore, for at least the same reasons, claims 4 and 8 are patentable over Kato.

Furthermore, Kato fails to specifically disclose that the recess portion extends a width more than at least one lead. In other words, the recess of Kato may only extend less than one lead (notch). The present invention particularly proposes that recess portion has extended over at least one lead as the preferred choice. This is not obvious over Kato, and has produced

unexpected results as described in, for example, page 10, lines 11-23 of the specification.

For at least the foregoing reasons, Applicants respectfully submits that independent claims 1 and 5 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 2-4 and 6-11 patently define over the prior art references as well.

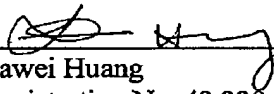
CONCLUSION

It is believed that all the pending claims 1-11 of the invention patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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